



THE UNIVERSITY OF ARIZONA.

Cooperative Extension

INSECT REPELLENTS



Mosquitoes, biting flies, chiggers and ticks can be annoying and sometimes pose a serious risk to public health. In certain areas of the United States, mosquitoes can transmit diseases like equine and St. Louis encephalitis. More recently transmission of West Nile Virus has become a major concern. Biting flies can inflict a painful bite that can persist for days, swell, and become infected. Ticks can transmit serious diseases like Lyme disease (the northwestern corner of Arizona is classed as a low risk area, and it is only in this part of Arizona that the vector exists at all) and Rocky Mountain spotted fever. When properly used, arthropod (insects, ticks, mites, etc.) repellents can discourage biting arthropods from landing on treated skin or clothing.

How Do We Attract Biting Arthropods?

The factors involved in attracting biting arthropods to a host are complex. Arthropods use visual, thermal and olfactory (smell) stimuli to locate a host. Visual stimuli are important for day biting insect in-flight orientation. Dark-colored clothing increases your chances of being bitten.

Between 300 and 400 different compounds are released from a human body as by-products of metabolism and more than 100 volatile compounds can be detected in human breath. Carbon dioxide and lactic acid are two of the best-studied mosquito attractants.

At close range, skin temperature and moisture may also further attract biting arthropods.



Bart Drees

Horse fly, *Tabanus* sp.

Choosing Insect Repellents

Insect repellents are available in various forms and concentrations. Aerosol and pump-spray products are intended for skin applications as well as for treating clothing. Liquid, cream, lotion, spray, and stick products enable direct skin application. Products with a low concentrations of active ingredient may be appropriate for situations where exposure to insects is minimal. Higher concentrations of active ingredient may be useful in highly infested areas or with insect species that are more difficult to repel. Where appropriate, consider non-chemical ways to deter biting insects — window and door screens, bed netting, long sleeves, and long pants.



John Jackman

Brown dog tick, *Rhipicephalus sanguineus*

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AZ1311

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This information has been reviewed by university faculty.

cals.arizona.edu/pubs/insects/az1311.pdf

Using Insect Repellents Safely

The Environmental Protection Agency (EPA) recommends the following precautions when using insect repellents:

- Apply repellents only to exposed skin and/or clothing (as directed on the product label). Do not use under clothing.
- Never use repellents over cuts, wounds, or irritated skin.
- Do not apply to eyes and mouth, and apply sparingly around ears. When using sprays do not spray directly onto face; spray on hands first and then apply to face.
- Do not allow children to handle the products, and **do not apply to children's hands**. When using on children, apply to your own hands and then apply to the child's skin.
- Do not spray in enclosed areas. Avoid breathing a repellent spray, and do not use it near food.
- Use just enough repellent to cover exposed skin and/or clothing. Heavy application and saturation is generally unnecessary for effectiveness; if biting insects do not respond to a thin film of repellent, then apply a bit more.
- After returning indoors, wash treated skin with soap and water or bathe. This is particularly important when repellents are used repeatedly in a day or on consecutive days. Also, wash treated clothing before wearing it again. If you suspect that you or your child are reacting to an insect repellent, discontinue use, wash treated skin, and then call your local poison control center if symptoms persist. If you go to a doctor, take the repellent with you. Reactions to repellents usually take the form of burning or irritated skin where the repellent has been applied.
- Get specific medical information about the active ingredients in repellents and other pesticides by calling the National Pesticide Information Center (NPIC) at 1-800-858-7378. NPIC operates from 6:30 a.m. to 4:30 p.m. (Pacific Time), 9:30 a.m. to 7:30 p.m. (Eastern Time), 7 days a week. The NPIC Web site is: <http://npic.orst.edu/>.

Important Information on Using Repellents

As the ambient temperature increases the longevity of the repellents is reduced.

EPA recommends the following precautions when using an insect repellent:

- Check the container to ensure that the product bears an EPA-approved label and registration number. Never use a product that has not been approved for use by EPA!
- Read the entire label before using a pesticide. Even if you have used it before, read the label again - don't trust your memory.
- Follow use directions carefully, use only the amount directed, at the time and under the conditions specified, and for the purpose listed. For example, if you need a tick repellent, make sure that the product label lists this use. If ticks are not listed, the product may not be formulated for that use, and therefore be ineffective.
- Store repellents away from children's reach, in a locked utility cabinet.



Henry Hagedorn

Types of Repellents

CHEMICAL

DEET

DEET (chemical name, N,N-diethyl-3-methylbenzamide also listed as N,N-diethyl-m-toluamide) is the active ingredient in many insect repellent products. DEET's most significant benefit is its ability to repel potentially disease-carrying insects and ticks. Products containing DEET currently are available to the public in a variety of liquids, lotions, sprays, and impregnated materials (e.g., wrist bands). Formulations registered for direct application to human skin contain from 4 to 100% DEET.

DEET is designed for direct application to human skin to repel insects, rather than kill them. After it was developed by the U.S. Army in 1946, DEET was registered for use by the general public in 1957. Approximately 230 products containing DEET are currently registered with EPA by about 70 different companies.

Skin sensitivity to DEET can develop after repeated use. EPA is no longer allowing child safety claims on product labels. These claims currently appear on certain products containing a DEET concentration of 15% or less. Use lower levels (<6%) of DEET on children. Do not use DEET on infants or if you are pregnant.

Amount DEET	Approx. Hours of Protection
30%	6.5
15%	5
10%	3
5%	2

Note: Protection time indicated for products are specific to certain mosquito species.

DEET impregnated wrist bands **do not** provide any protection from biting arthropods.



General Purpose Skinsations contains 6.65% DEET

Off!® Deep Woods (SC Johnson) 23.8% DEET 301.5 minutes of protection time
Off!® Skintastic for Kids (SC Johnson) 4.75% DEET 88.4 minutes of protection time
Skinsations (Cutter®) 6.65% DEET 110 minutes of protection time



Dawn H. Gouge

This Backwoods product is longer lasting and contains 21.85% DEET

IR3535-based repellent

A chemical repellent that has been used in Europe for over 20 years, IR3535 was approved for use in the United States in 1999.

Skin So Soft Bug Guard IR3535® (Avon) 22.9 minutes protection time

BOTANICALS

• Citronella or Lavender Oil

It is recommended that personal insect repellents such as citronella and oil of lavender not be used on children under 2 years of age.

Registered citronella oil repellents protect people against mosquito bites for less than one hour. The registered lavender oil repellent protects for half an hour or less.

The citronella-based repellents tested by Fradin & Day (2002), protected for 20 minutes or less. Slow release products do not provide significant added benefit.

Based on animal studies, citronella-based products appear to be potential dermal sensitizers. Therefore, allergic reactions may occur in some individuals.

Citronella candles and incense do reduce the chances of being bitten by mosquitoes for individuals sitting close by. However, at best mosquito bites have been reduced by 42% (Fradin, 1998).

Repel Lemon Eucalyptus Insect Repellent

(WPC Brands)

120.1 minutes protection time

Fite Bite™ Plant-Based Insect Repellent

(Travel Medicine™)

120.1 minutes protection time



Dawn H. Gouge

This repellent contains 30% lemon eucalyptus oil.

Natrapel™
(TenderCorp.)
10% citronella
<20 minutes of protection time

Herbal Armor
(All Terrain)
12% citronella + oils
<20 minutes of protection time



Dawn H. Gouge

• Eucalyptus oil

Products containing eucalyptus oil were the most effective herbal repellents tested and lasted as long as low concentrations of DEET!!

Repel Lemon Eucalyptus and Fite Bite™ Plant-Based Insect Repellent are derived from oil obtained from the leaves of the *Eucalyptus citriodora* tree. They provide very good protection for an extended time.

Off!® Botanicals contains 10% p-Menthane-3, 8-diol found in Eucalyptus plants

• Soybean Oil

Bite blocker combines soybean oil, geranium oil and coconut oil in a formulation that has been available in Europe for several years.

This is a **great** product for kids and is very effective against mosquitoes. It is one of very few products listed as safe for pregnant women and infants. Bite Blocker is available in a variety of formulas, including one for kids and a sports formulation which includes SPF 15 protection.



Dawn H. Gouge



Dawn H. Gouge

Bite Blocker™ for Kids
(HOMS)
soybean oil
94.6 minutes protection time



Dawn H. Gouge

Bite Blocker™ for Kids contains the same ingredients but at lower concentrations. Although most of the ingredients are food grade, they should not be ingested.

Bite Blocker™ is safe in that it contains all natural ingredients that are mainly food-grade and listed by the EPA as minimum risk. Ingredients are coconut oil, soybean oil, purified water, geranium oil, glycerin, aloe, lecithin, vanillin. It works and it smells good too!

• Mineral Oil

Avon Skin-So-Soft Bath Oil contains two chemicals (diisopropyl adipate and benzophenone) in its formulation which are repellent to mosquitoes to some extent. However, the longevity of repellency is very limited.

Skin-So-Soft Bath Oil
(Avon)
9.6 minutes of protection

• Permethrin

Permethrin repellents should be used to treat the outside of clothing only because skin contact deactivates the chemical within fifteen minutes. It can be used by itself or along with skin applied repellents. Permethrin is a contact insecticide which actually kills ticks or insects landing on treated clothing. Skin contact should be avoided. As a clothing, tent or sleeping bag application, permethrin is very effective at keeping ticks from attaching to you and at reducing mosquito bites.

Permethrin is an effective repellent against mosquitoes and flies and can be used in conjunction with a skin based repellent. Spray applications of permethrin can remain effective up to 14 days of exposure to light or oxygen, or through two aggressive washings. By storing the treated clothing in black plastic bags between uses the fourteen days of protection can be extended considerably. If necessary a heavier application can remain effective even longer. Bed nets can be treated with permethrin.



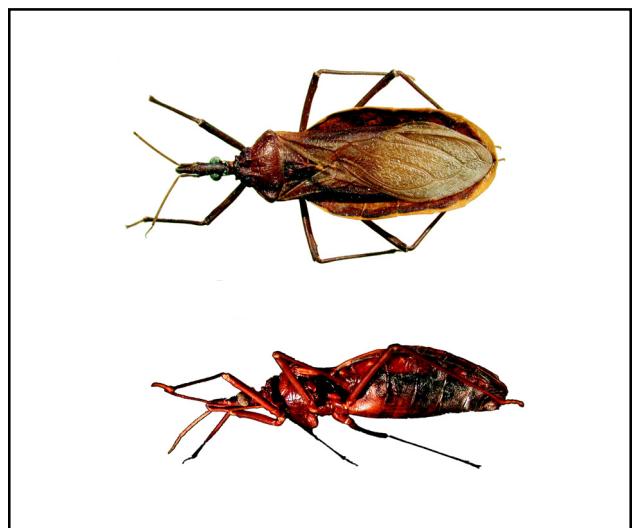
Contains 0.5% Permethrin

Reference

Product data has been taken from:

Fradin MF, Day JF. Comparative efficacy of insect repellents against mosquito bites. *New England Journal of Medicine*. 2002. 347(1):13-8.

Fradin MF. Mosquitoes and Mosquito Repellents: A Clinician's Guide. *Annals of Internal Medicine*. 1998. 128:931-940.



Kirk A. Smith

Kissing bug, *Triatoma recurva*.

If Bitten

Several strategies exist for relieving the itch of arthropod bites. The first step is to clean the bite area with soap and water. Topical corticosteroids can reduce the rash, itching, and discomfort. Topical diphenhydramine and caine-containing derivatives should be avoided because of concerns about inducing allergic contact sensitivity. Oral antihistamines can be effective in reducing the symptoms of mosquito bites. Use of a cold compress can be helpful, but do not apply ice directly to the skin.

IF A SEVERE REACTION OCCURS CALL THE ARIZONA POISON AND DRUG INFORMATION CENTER 1-800-222-1222

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